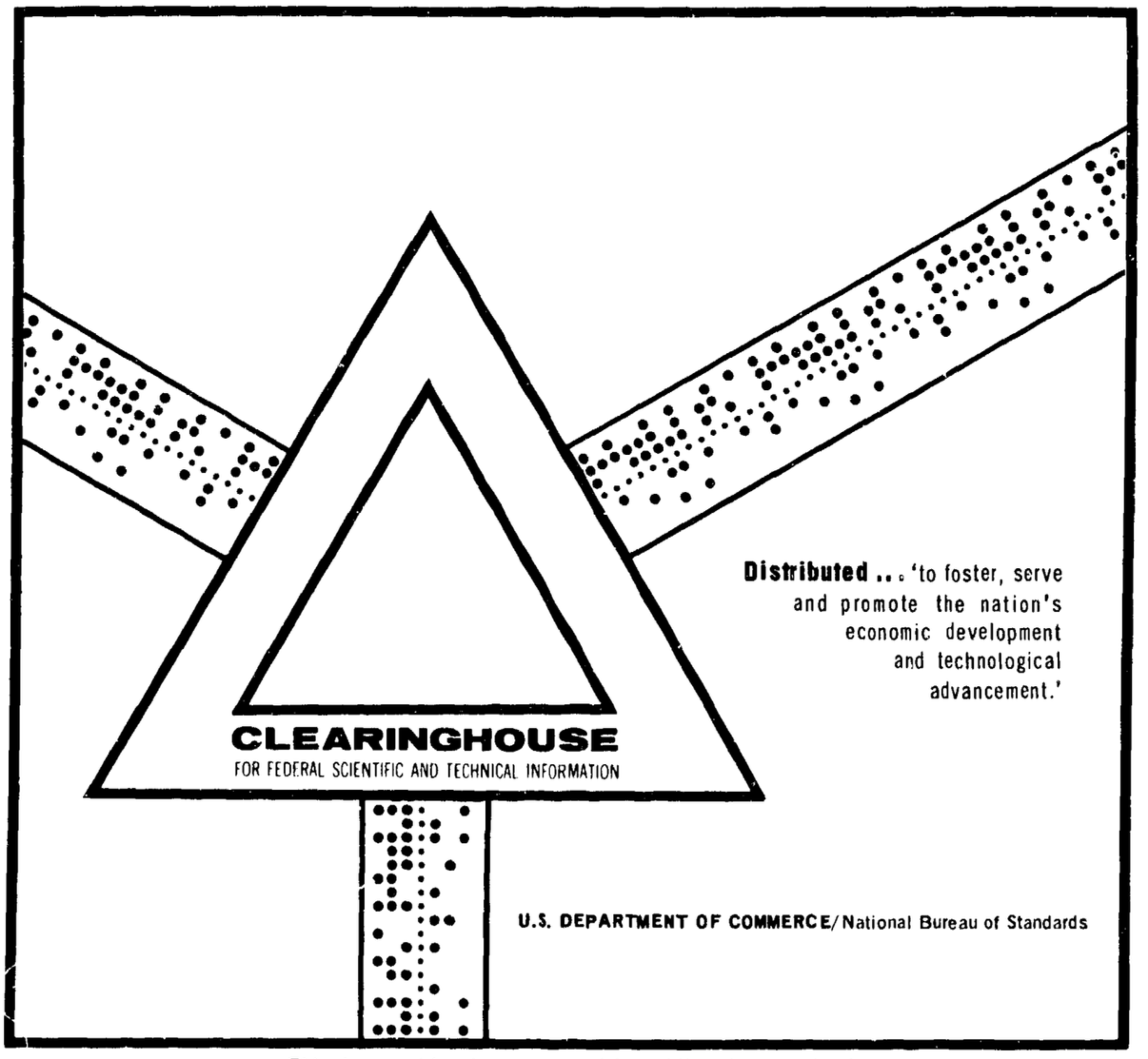
MECHANICAL-PROPERTY DATA 7049 ALUMINUM: T73 FORGINGS.

Battelle Memorial Institute
Columbus, Ohio

December 1969



MECHANICAL-PROPERTY DATA 7049 ALUMINUM

T73 Forgings

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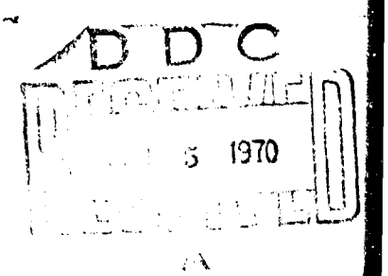

Air Force Materials Laboratory
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

December, 1969

Prepared by

Battelle Memorial Institute
Columbus Laboratories
Columbus, Ohio 43201

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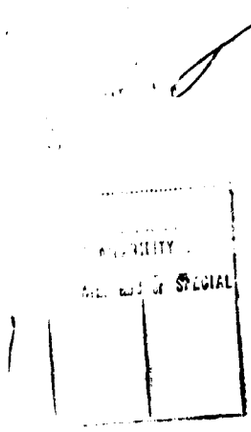
This data sheet was prepared by Battelle Memorial Institute under Contract F33615-69-C-1115. The contract was initiated under Project No. 7381, "Materials Application", Task No. 738106, "Engineering and Design Data". The major objectives of this program are to evaluate newly developed structural materials of potential Air Force weapons-system interest and then to provide data-sheet-type presentations of these data. The program was assigned to the Structural Materials Engineering Division at Battelle under the technical supervision of Mr. Walter S. Hyler. Project engineer was Mr. Omar Deel. The program was administered under the direction of the Air Force Materials Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, by Mr. Marvin Knight, project engineer.

Notices



7049-T73

Alloy X7049 is a new development by Kaiser Aluminum and Chemical Corporation. It was designed to have a strength level in the range of 7075-T6 and 7079-T6, coupled with a high resistance to stress-corrosion cracking. The temper designation -T73 has been assigned to cover the alloy with these characteristics. The initial development and production has been in the form of die forgings and hand forgings.

The threshold level for stress-corrosion cracking is reported by Kaiser to be 45 ksi.

All specimens used for this test program were from a 5-inch-thick forging. The composition of this forging is as follows:

Si	0.07
Fe	0.13
Mn	0.01
Cu	1.48
Mg	2.45
Cr	0.16
Zn	7.50
Al	Balance

7049 DATA[a]

Condition: T73
Thickness: 5-Inch Forging

Properties	Temperature, F			
	RT	250	350	500
Tension				
F_{tu} (longitudinal), ksi	72.9	62.2	49.7	16.7
F_{tu} (transverse), ksi	74.9	62.3	50.3	18.1
F_{tu} (short transverse), ksi	70.9	--	--	--
F_{ty} (longitudinal), ksi	64.2	59.7	49.0	16.6
F_{ty} (transverse), ksi	66.5	60.1	49.5	18.0
F_{ty} (short transverse), ksi	61.9	--	--	--
e_t (longitudinal), percent in 2 in.	8.8	14.8	20.0	29.3
e_t (transverse), percent in 2 in. n	11.0	15.7	18.0	30.0
e_t (short transverse), percent in 2 in.	6.0	--	--	--
E_t (longitudinal), 10^6 psi	10.2	9.9	8.8	7.1
E_t (transverse), 10^6 psi	10.6	10.2	8.2	6.9
E_t (short transverse), 10^6 psi	9.9	--	--	--
Compression				
F_{cy} (longitudinal), ksi	66.8	64.0	53.3	19.4
F_{cy} (transverse), ksi	67.6	63.0	51.9	19.7
E_c (longitudinal), 10^6 psi	10.6	9.4	8.4	8.2
E_c (transverse), 10^6 psi	10.6	9.9	8.6	7.9
Shear[b]				
F_{su}, (longitudinal), ksi	47.8	U	U	U
F_{su}, (transverse), ksi	47.7	U	U	U
Impact (V-notch charpy), ft-lb	4.1[c]	U	U	U
Fracture Toughness, K_{Ic}, ksi $\sqrt{in.}$	31.7	(d)	U	U

Properties	Temperature, F			
	RT	250	350	500
Axial Fatigue (Transverse)(e)				
Unnotched, R = 0.1				
10^3 cycles, ksi	73	71	70	--
10^5 cycles, ksi	57	53	48	--
10^7 cycles, ksi	46	40	38	--
Notched (K_t = 3.0), R = 0.1				
10^3 cycles, ksi	50	50	50	--
10^5 cycles, ksi	21	20	19	--
10^7 cycles, ksi	16	13	11	--
Creep (Transverse)				
0.2% plastic deformation 100 hr, ksi	NA	42	15	4
0.2% plastic deformation 1000 hr, ksi	NA	36	9	2.7
Stress Rupture (Transverse)				
Rupture 100 hr, ksi	NA	50	21	5.6
Rupture 1000 hr, ksi	NA	40	13.5	4.3
Stress Corrosion				
80% F_{ty}, 1000 hr max	No cracks(f)			
Coefficient of Thermal Expansion				
13.0×10^{-6} in./in./F (RT to 212 F)				
Density 0.099 lb/in.^{3}				

(a) Data are average of triplicate tests conducted at Battelle unless otherwise indicated. Fatigue, creep, and stress-rupture values are from data curves generated using a greater number of tests.

(b) Double-shear pin-type specimen, 1/2-inch diameter.

(c) 4.1 at RT, 3.5 at -100 F, 3.2 at -320 F.

(d) Average of six chevron-notched slow-bend tests. Tests at 250 F proved to be invalid.

(e) "R" represents the algebraic ratio of minimum to maximum stress in one cycle; that is, $R = S_{min}/S_{max}$. "K_t" represents the Neuber-Peterson theoretical stress-concentration factor.

(f) Three-point bend test. Alternate immersion in 3-1/2 percent NaCl.

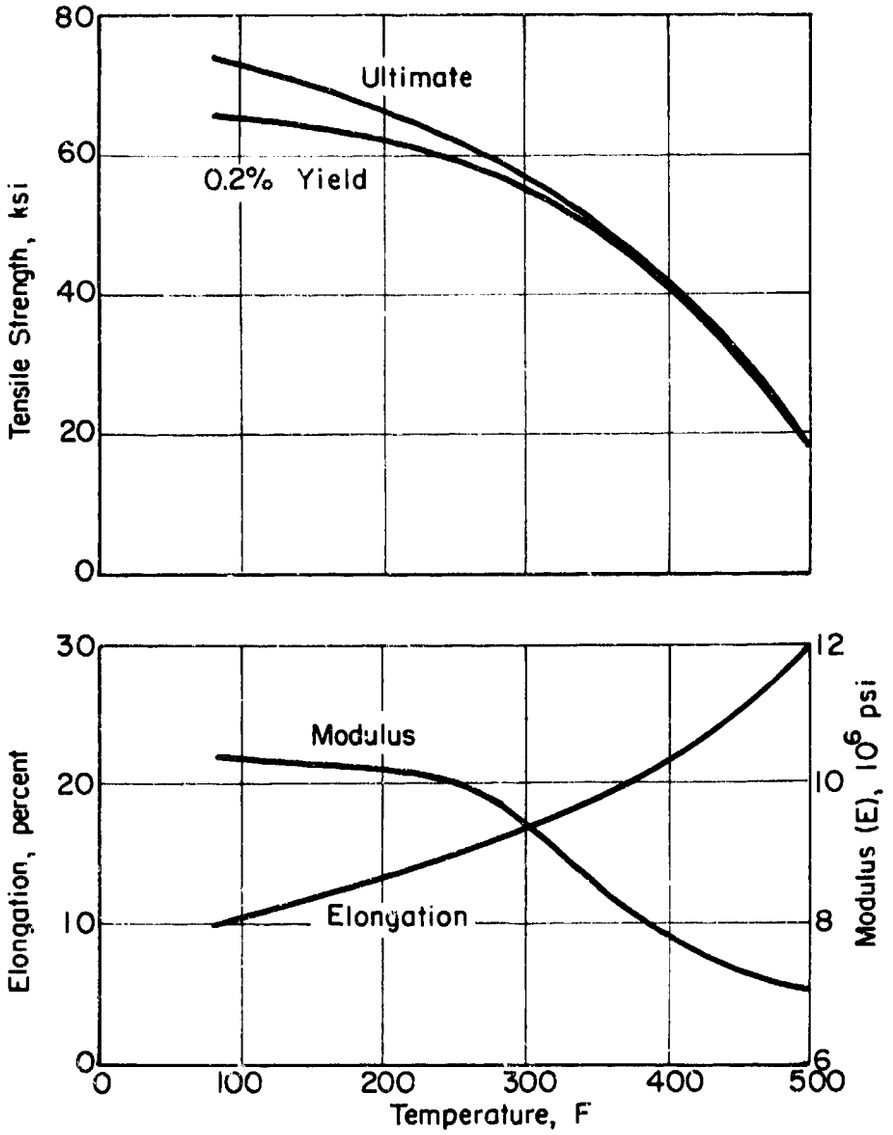


FIGURE 1. EFFECT OF TEMPERATURE ON THE TENSILE PROPERTIES OF 7049-T73 ALUMINUM FORGINGS

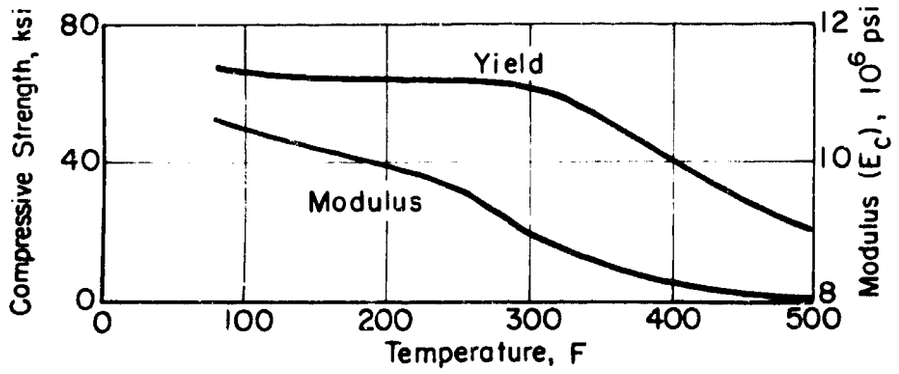


FIGURE 2. EFFECT OF TEMPERATURE ON THE COMPRESSION PROPERTIES OF 7049-T73 ALUMINUM FORGINGS

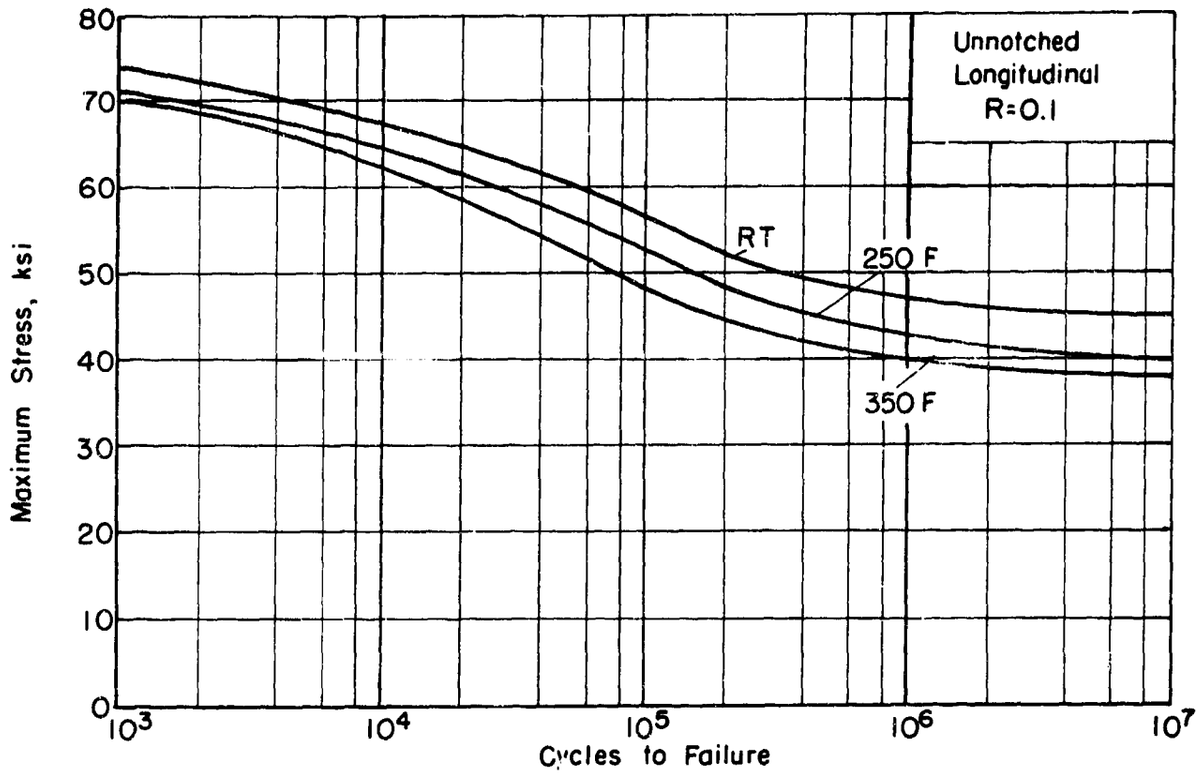


FIGURE 3. AXIAL-LOAD FATIGUE RESULTS FOR UNNOTCHED 7049-T73 ALUMINUM FORGING AT THREE TEMPERATURES

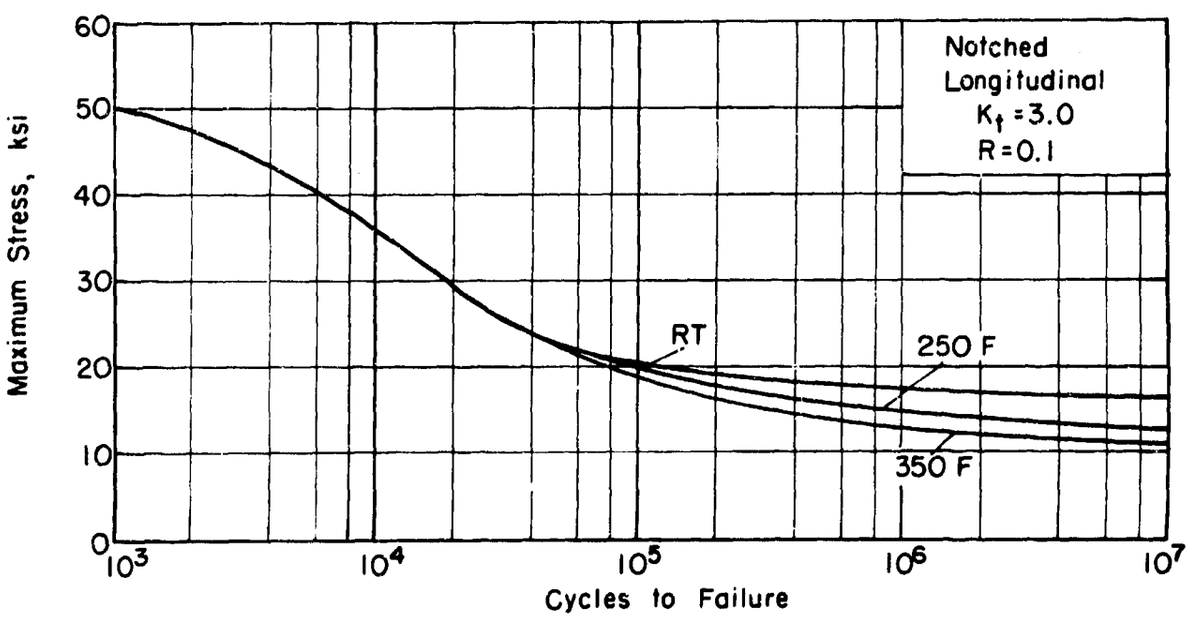


FIGURE 4. AXIAL-LOAD FATIGUE RESULTS FOR NOTCHED (K_t=3.0) 7049-T73 ALUMINUM FORGING AT THREE TEMPERATURES

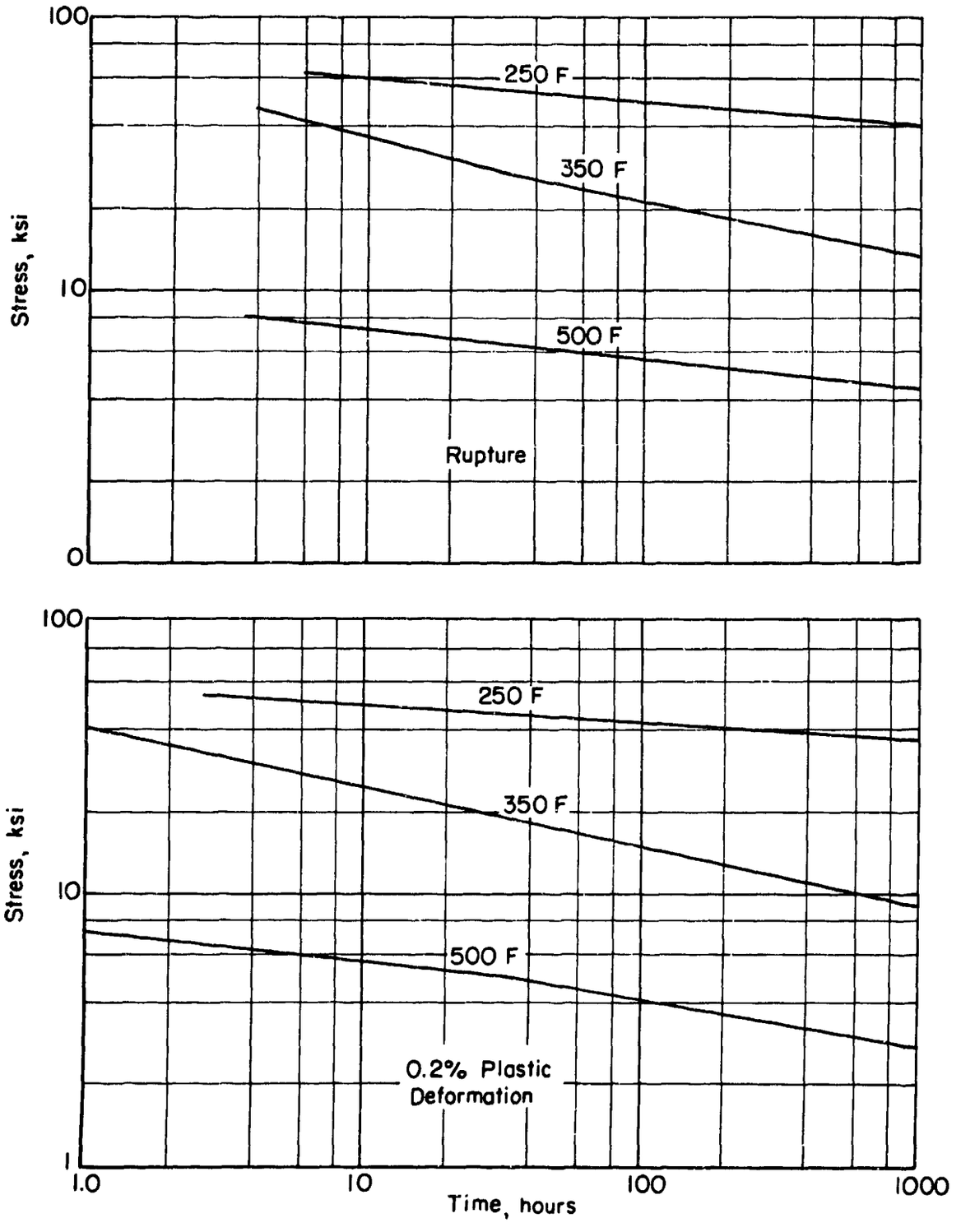


FIGURE 5. STRESS-RUPTURE AND PLASTIC-DEFORMATION CURVES FOR 7049-T73 ALUMINUM FORGINGS